Entergy

Entergy Operations, Inc.
1448 S.R. 333
Russellville, AR 72801
Tel 501 858-5000

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U. S. Nuclear Regulatory Commission
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Subject: Arkansas Nuclear One - Unit - 1
Docket No. 50-313
License No. DPR-51
Licensee Event Report 50-313/1998-005-00

Gentlemen:

In accordance with 10CFR50.73(a)(2)(iv), enclosed is the subject report concerning two manual reactor trips and a manual actuation of the Emergency Feedwater System.

Very truly yours,

Jimmy D. Vandergrift

Jimmy D. Vandergrift
Director, Nuclear Safety

JDV/tfs

enclosure

270031

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IE22

cc: Mr. Ellis W. Merschoff
Regional Administrator
U. S. Nuclear Regulatory Commission
Region IV
611 Ryan Plaza Drive, Suite 400
Arlington, TX 76011-8064

NRC Senior Resident Inspector
Arkansas Nuclear One
P.O. Box 310
London, AR 72847

Institute of Nuclear Power Operations
700 Galleria Parkway
Atlanta, GA 30339-5957

1184

NRC FORM 366 (5-92) U.S. NUCLEAR REGULATORY COMMISSION

APPROVED BY OMB NO. 3150-0104
EXPIRES 5/31/95

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST: 50.0 HRS. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE INFORMATION AND RECORDS MANAGEMENT BRANCH (MNBB 7714), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20555-0001, AND TO THE PAPERWORK REDUCTION PROJECT (3150-0104), OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20503.

LICENSEE EVENT REPORT (LER)

FACILITY NAME (1)	DOCKET NUMBER (2)	PAGE (3)
Arkansas Nuclear One - Unit 1	05000313	1 OF 6

TITLE (4) Two Manual Reactor Trips And A Manual Actuation Of The Emergency Feedwater System Due To Reduced Circulating Water Flow To The Main Condenser Caused By Unusually Large Intrusions Of Fish Exceeding The Removal Capability Of The Traveling Screens

EVENT DATE (5)			LER NUMBER (6)			REPORT DATE (7)			OTHER FACILITIES INVOLVED (8)	
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	MONTH	DAY	YEAR	FACILITY NAME	DOCKET NUMBER
12	25	1998	1998	005	00	01	21	1999	FACILITY NAME	DOCKET NUMBER

OPERATING MODE (9)	N	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR: (Check one or more) (11)											
			20.402(b)		20.405(c)	X	50.73(a)(2)(iv)		73.71(b)				
POWER LEVEL (10)	100		20.405(a)(1)(i)		50.36(c)(1)		50.73(a)(2)(v)		73.71(c)				
			20.405(a)(1)(ii)		50.36(c)(2)		50.73(a)(2)(vii)		OTHER				
			20.405(a)(1)(iii)		50.73(a)(2)(i)		50.73(a)(2)(viii)(A)		Specify in				
			20.405(a)(1)(iv)		50.73(a)(2)(ii)		50.73(a)(2)(viii)(B)		Abstract Below				
			20.405(a)(1)(v)		50.73(a)(2)(iii)		50.73(a)(2)(x)		and in Text				

LICENSEE CONTACT FOR THIS LER (12)

NAME	TELEPHONE NUMBER (Include Area Code)
Thomas F. Scott, Nuclear Safety and Licensing Specialist	501-858-4623

COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPRDS		CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPRDS

SUPPLEMENTAL REPORT EXPECTED (14)			EXPECTED SUBMISSION DATE (15)	MONTH	DAY	YEAR
YES (If yes, complete EXPECTED SUBMISSION DATE)	X	NO				

ABSTRACT (Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines) (16)

On December 25 and 28, 1998, the reactor was manually tripped due to reduced Circulating Water (CW) System flow caused by unusually large build-up of fish, mostly threadfin shad, on the traveling screens. The cause of both events was the traveling screen system being unable to remove the existing volume of shad while maintaining acceptable screen differential pressure and CW flow. Following the first event, corrective actions were taken to increase fish removal capability and reduce CW flow rate during shad runs; however, another large shad run during the startup resulted in the second reactor trip. Additional actions to increase screen capacity and reliability were taken and the plant was successfully restored to full power. During both events, Reactor Coolant System parameter responses were normal and rod drop times were within limits. Emergency Feedwater was manually actuated during the first event as a contingency for potential loss of condenser vacuum. The condition of the traveling screens did not cause the safety-related Service Water System to be inoperable during either event. The necessity for additional long-term corrective actions is being evaluated.

A. Plant Status

Prior to the event resulting in the first manual reactor trip, Arkansas Nuclear One Unit 1 (ANO-1) was operating in steady-state conditions at 100 percent power. Before the event resulting in the second manual reactor trip, ANO-1 was at approximately 13 percent power with a startup in progress.

B. Event Description

At 0851 on December 25, 1998, and at 0842 on December 28, 1998, the reactor was manually tripped. Both trips were due to reduced Circulating Water (CW) [KE] flow caused by build-up of fish on the traveling screens.

Water from the Dardanelle Reservoir is provided via an intake canal to an Intake Structure [NN]. This water serves as a source for safety-related Service Water (SW) [BI] Systems on both units, the Fire Water System [KP], and the ANO-1 CW System. It also provides makeup to the Emergency Cooling Pond (ECP) [BS] and ANO-2 Circulating Water (CW) [KE] System. The ANO-2 CW System is a closed loop system using a natural draft cooling tower. Pumps are protected from flotsam and debris in the intake canal by components that include traveling screens.

On December 25, 1998, shortly before 0800, an influx of fish, mostly threadfin shad approximately three inches long, was observed at the intake structure. This was expected based on operating experience and recent weather conditions that involved a sudden decrease in lake water temperature. Operations personnel were closely monitoring the condition of the traveling screens and the screen wash system. CW pumps were stopped with others started as necessary to protect the screens from excessive differential pressures. At 0843 the shad inflow intensified leading to several CW pump manipulations. By 0847, only one CW pump remained in service and a rapid power reduction began. At 0851, with power at approximately 75 percent and condenser vacuum falling, the drives for the traveling screens associated with the operating CW pump stopped and could not be quickly restarted. The reactor was manually tripped, and the operating CW pump was stopped. At 0914, Emergency Feedwater (EFW) [BA] was manually actuated as a contingency for potential loss of condenser vacuum. Loop "B" feedwater startup control valve did not properly respond in controlling Once Through Steam Generator (OTSG) levels after the reactor trip; however, levels were maintained near the normal post-trip setpoints throughout the event by Main Feedwater (MFW) [SJ] and EFW. At 0916 and 0918, "B" and "C" CW pumps were started. Just prior to the start of "B" CW pump, condenser vacuum reached a minimum pressure of 24.3 inches. At 0926, condenser vacuum was restored to normal. Reactor Coolant System (RCS) [AB] parameter responses were normal and all control rod drop times were within limits.

A post-transient review was performed to determine corrective actions prior to startup. Significant evaluations and corrective actions are addressed below. Several other minor malfunctions or abnormalities were also corrected.

One Main Steam Safety Valve (MSSV) for each OTSG did not reseat as quickly as expected. The actual blowdown was subsequently determined to be within allowable tolerance.

The circuit breaker for one traveling screen drive motor tripped during high fish loading. The circuit breakers for two other screens had tripped on the previous day. Review of breaker coordination and thermal overload curves indicated that the breakers should not have tripped without tripping the thermal overloads. For this reason, the circuit breakers for all traveling screen drive motors were replaced with tested breakers. The removed breakers were subsequently tested with satisfactory results. The shear pin for one traveling screen that had sheared, as designed, during high screen loading was replaced. All eight ANO-1 traveling screens were inspected. On one screen, two panels that were slightly damaged were replaced.

The Loop "B" feedwater startup control valve did not control OTSG levels due to oil accumulation in the valve positioner. After the positioner internals were cleaned, the valve was tested and returned to service. The positioner for the Loop "A" corresponding valve was inspected and found to be clean.

Fish lifting lips had been typically installed on every other traveling screen filter panel. The purpose of these lips is to lift stunned or dead fish out of the water and transfer them to the debris removal system without allowing them to recycle back onto the lower panels. To increase the fish removal capacity, fish lifting lips were added to all panels that did not already have them.

The CW System operating procedure was modified to minimize flow through the screens during periods of high shad concentration by throttling the condenser water box inlet valves.

Following completion of corrective actions, performance of the CW System and traveling screens was monitored and results indicated that the plant was ready to start up. The reactor was taken critical at 2230 on December 27, 1998. By 0800 on December 28, reactor power was at approximately 13 percent and three CW pumps were operating. Another large shad influx began. Operations personnel closely monitored the condition of the traveling screens and screen wash system. Condenser waterbox inlet valves were throttled as recommended from the earlier event. When excessive differential pressures occurred across the traveling screens, the affected CW pumps were stopped and others started as necessary. The water box inlet valves for two water boxes were throttled further and two inlets were closed completely in an effort to minimize differential pressure across the traveling screen system. At 0810 the shad inflow intensified and several CW pump starts and stops occurred over the next several minutes. When only one CW pump available, a plant shutdown was initiated at 0838. At 0842, with reactor power at approximately 8 percent, the reactor was manually tripped when the discharge strainers for both screen

wash pumps reached a high differential pressure. The one operating CW pump and its associated traveling screens remained in service. Loop "B" feedwater startup control valve again did not properly control OTSG level following the trip; however, levels were maintained with manual control of the valve. RCS parameter responses were normal and all control rod drop times were within limits. At 0819, "B" SW pump was started and "A" SW pump stopped due to lowering of level in "A" SW bay and elevated differential pressure on "A" SW pump discharge strainer. At 0835 "C" SW bay suction was transferred to the ECP as a precautionary measure. "A" SW bay suction was transferred to the ECP at 0932. The SW system remained operable throughout this event.

During the event on December 28, the circuit breaker thermal overloads on each traveling screen drive motor tripped during times when high loading was present on the screens. The drive motors operated as required after the thermal overloads were reset. Also during high loading, the shear pins for two traveling screens sheared as designed. The pins have been replaced. Following the event, the ANO-1 traveling screens were inspected. Four panels on one screen and two panels on another were damaged. Damage ranged from complete failure of the fiberglass frame that holds the screens in place to partial failure of the frames. Prior to the next startup, screen panels were repaired, replaced, or evaluated as acceptable for continued operation. The backwash valve for the screen wash pump discharge strainers is designed to open on a high strainer differential pressure. This feature did not function during the event and had to be manually performed. Corrective actions were completed prior to restart.

The Loop "B" feedwater startup control valve response that allowed "B" OTSG level to rise was determined to have resulted from control switching from level error to a flow error demanding slightly more flow than necessary for decay heat removal. A module in the Integrated Control System (ICS) [JA] was adjusted to provide greater assurance that feedwater flow error will remain positive following a reactor trip. This assured positive flow error will force the ICS to control on level error, as desired. This change was implemented for both feedwater loops and tested satisfactorily prior to restart.

Other corrective actions prior to restart included: (1) installing additional debris ledges with fish lifting lips at the center of the steel-framed panels, (2) upgrading the screen drive motors by doubling the speed and increasing the rating from 2 to 5 horse-power, (3) increasing the size of the circuit breakers, (4) installing larger thermal overloads, (5) replacing shear pins with larger diameter pins, and (6) replacing two sets of fiberglass-framed steel traveling screen panels with steel-framed panels. These changes significantly increased the fish removal capability and reliability of the traveling screens. Enhancements were also made to the traveling screen annunciator corrective action procedure.

Following the second reactor trip, one MSSV for each OTSG appeared to have opened below the minimum setpoint tolerance. In-place setpoint testing verified that one of the two suspect valves was within the acceptable as-found range. The other valve, PSV-2699 for "A" OTSG, was found to have a setpoint

of 989.8 psig with minimum allowable of 1018.5 psig. It was adjusted to within the acceptable range. An Engineering evaluation determined that the MSSVs were capable of performing their required safety functions with PSV-2699 in the as-found condition.

The reactor was critical at 1756 on January 5, 1999 and the turbine generator was placed on line at 2328 that day. The unit reached full power at 2305 on January 6, 1999.

C. Root Cause

Shad impingement on the intake screens has occurred throughout the life of ANO-1. It has been documented in various letters with the NRC as early as 1974. There is a natural die off of threadfin shad during the winter season due to their having a low temperature change tolerance. A sudden decrease in water temperature causes them to die or become so lethargic that they are unable to resist the intake current. Previous shad runs have been accommodated without having to trip the reactor. The cause of these events is attributed to the traveling screen system being unable to remove the shad and maintain screen differential pressures within limits due to the unusually severe inrushes of shad. The site biologist reported that the shad population in Dardanelle Reservoir is at or near record levels.

D. Corrective Actions

Immediate corrective actions to correct identified equipment concerns and improve the fish removal capability of the traveling screens are described above.

Special fish removal devices, shad seines, were designed, tested, and installed for use upstream of the intake structure to provide temporary additional shad removal capability.

In order to provide another barrier to minimize fish intrusion, ANO plans to install at the mouth of the intake canal a temporary structure consisting of nets secured to an anchored barge. It is intended that this structure will be removed in the early spring when the potential for significant shad runs no longer exists.

The necessity for a more permanent structure at the mouth of the intake canal and other potential long-term corrective actions are being evaluated.

E. Safety Significance

Throughout the periods of high shad concentration during the first event, there was no significant carryover past the traveling screens. Damage to the traveling screen panel frames or some carryover during the second event may have contributed to the discharge strainer for "A" SW pump having a high

differential pressure. However, at no time during either event was the Service Water System or any of the other systems that receive water via the intake canal inoperable. During both events, "B" SW pump remained aligned to the ECP to ensure a cooling water supply unaffected by the shad runs. The "C" SW bay had been modified previously to add a strainer enclosure that provides an additional barrier between the CW and SW bays. This modification provided additional assurance of maintaining cooling of safety-related components by the SW System. The individual component failures did not prevent the capability of fulfilling any required safety function during either event. These events are judged to have had minimal actual safety significance.

F. Basis for Reportability

The manual reactor trip and manual EFW actuation on December 25, 1998, constituted Reactor Protection System (RPS) and Engineered Safety Features (ESF) actuations and were reported to the NRC Operations Center in accordance with 10CFR50.72(b)(2)(ii) at 1111 on December 25, 1998. This report included notification in accordance with 10CFR50.72(b)(2)(vi) that offsite notification had been made to a state agency.

The manual reactor trip on December 28, 1998, constituted an RPS actuation. At 1015 on December 28, the NRC Operations Center was notified in accordance with 10CFR50.72(b)(2)(vi) that offsite notification had been made to a state agency. After further review, ANO notified the NRC Operations Center at 1143 of an update to the original report in accordance with 10CFR50.72(b)(2)(ii) to report the RPS actuation.

This report is submitted in accordance with 10CFR50.73(a)(2)(iv) to document the RPS and ESF actuations. In accordance with guidance provided in Section 2.3 of NUREG-1022 Rev 1, both related events involving the same cause and occurring within a reasonably short time are being reported under a single Licensee Event Report.

G. Additional Information

There have been no previous similar events reported by ANO as Licensee Event Reports.

Energy Industry Identification System (EIIS) codes are identified in the text as [XX].

CATEGORY 1

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SCOTT,T.F. Entergy Operations, Inc.
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SUBJECT: LER 98-005-00:on 981225,two manual RTs & manual actuations of EFWS due to reduced CW flow to MC.Caused by large intrusions of fish exceeding removal capability of traveling screen.Increased fish removal capability.With 990121 ltr.

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